ANTERIOR SURGICAL APPROACHES TO THE SPINE*

by

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THIS PAPER IS a technical one. It concerns an operative approach to the vertebral bodies which can be used in the surgical treatment of Pott's disease and other spinal lesions, and especially lesions causing compression of the cord from in front. The surgical procedure which we employ at the cervical, cervico-thoracic and thoracic levels will be described.

To obtain access to *the cervical spine,* the shortest route is anterior to the sterno-mastoid muscle (Fig. 1). This allows the trachea and oesophagus to be retracted medially, and the sterno-mastoid and the cervical vessels laterally. It is the usual approach to the upper oesophagus.

The patient lies on his back, the head being turned towards the right side. The incision runs along the anterior margin of the left sterno-mastoid ; the muscle sheath is not opened so that it can be retracted

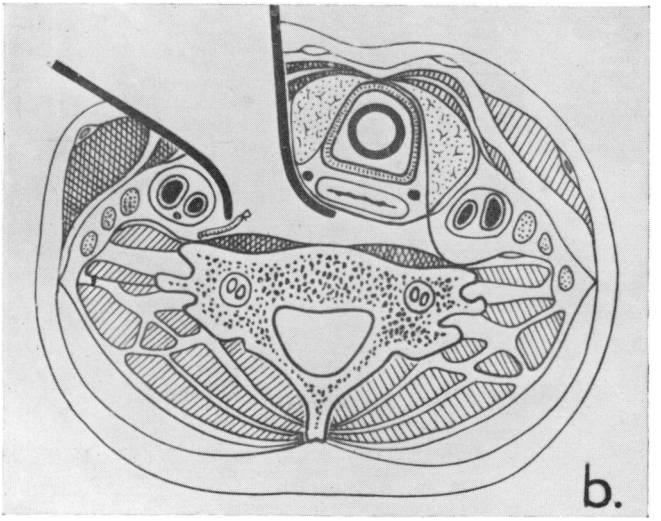

Fig. 1. Anatomical cross-section of the neck indicating the antero-lateral, pre-sterno-mastoid approach to the cervical spine.

backwards with the vessels. The spine is now near and the finger can readily feel it ; it can be easily reached after section of the thyroid veins and of the inferior thyroid artery.

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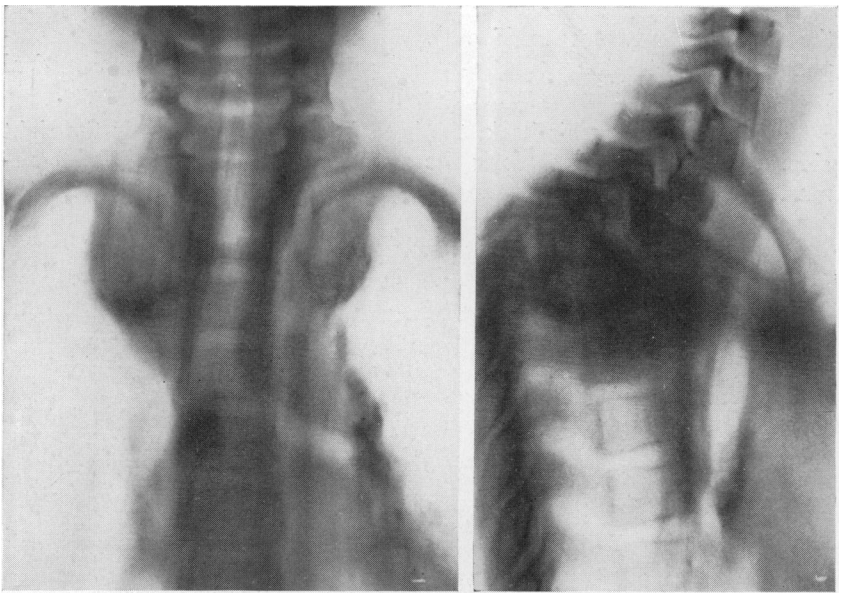
The oesophagus is now retracted after mobilisation and the spine becomes visible from the fourth to the seventh vertebra. At the lower part of the wound the cervico-thoracic junction can be explored by the finger, although the lordosis may not allow the surgeon to see the first thoracic vertebra.

For grafting the cervical spine, our friend, Henry Osmond-Clarke, employs a more lateral approach between the sterno-mastoid and the scalenes ; we have used it twice for drainage of abscesses pointing laterally. This route leads direct to the transverse processes, but it is not so con-



Figs. 2(*a*) and 2(*b*). Cervico-dorsal Pott's disease in a four-year-old patient with quadriplegia. Bilateral abscess, vertebral collapse with central abscess.

venient for the vertebral bodies which are deeper than by the approach by the anterior route, and in one case we damaged the sympathetic.

A case is quoted of a four-year-old child with a quadriplegia due to Pott's disease involving the first and second dorsal vertebrae, with a sharp kyphosis and a bilateral abscess (Fig. 2 (*a*) and (*b*)). After two months' medical treatment by plaster rest and antibiotics, the neurological signs disappeared ; an operation was then performed by the anterior approach and fluid pus was aspirated. Four months later spontaneous spinal fusion occurred (Fig. 2. (*c*) and (*d*)).

The *cervico-thoracic vertebral bodies* have an unhappy reputation for depth and surgical inaccessibility.

We had the opportunity of decompressing the cord at this level and used a cervico-thoracic anterior approach which appeared to be satisfactory, at any rate from a technical point of view.

The skin incision includes two parts—the cervical one, along the anterior border of the sterno-mastoid muscle, and the thoracic one in the mid-line of the sternum and carried down to the xiphoid process.

The cervical part of the operation is performed first; then the sternum is freed from its periosteum and cut longitudinally into two parts in the mid-line. This osteotomy of the sternum is accompanied by much oozing of blood until the Finochietto retractor has been inserted and widely opened. Then the two operation areas, the cervical and thoracic, are joined by dividing the sub-hyoid muscles, i.e., the sterno-hyoid and the sterno-thyroid. The pleura is carefully dissected on both sides and

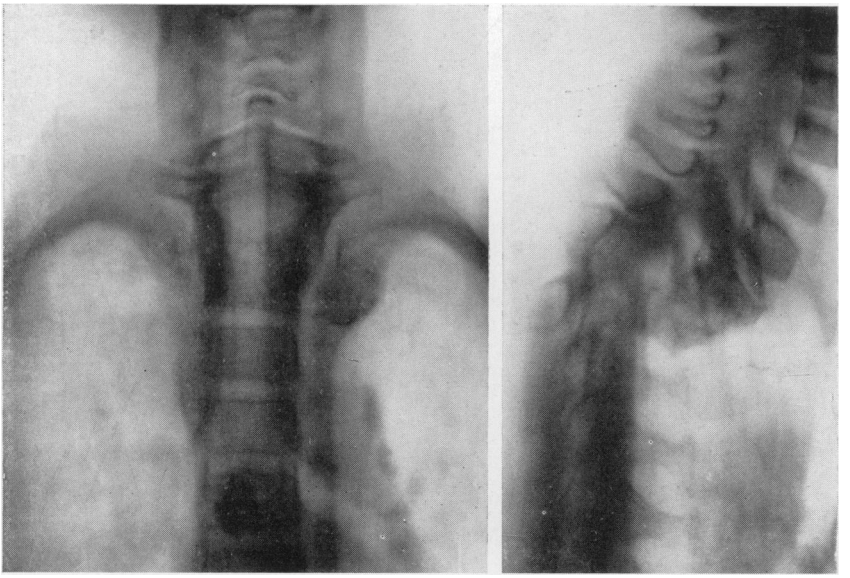


Fig. 2 (*c*) and (*d*). Same patient five months later, after anterior cervical approach and succion of the abscess. All neurological signs relapsed. Notice bone union of vertebral bodies.

retracted and by progressive blunt dissection the vascular area is reached; the left innominate vein is divided between ligatures and the upper border of the aortic arch exposed (Fig. 3 (*a*) and (*b*)). The trachea and oesophagus are retracted towards the right side and the cervico-thoracic vertebrae from the fourth cervical to the third dorsal can be seen between the innominate artery and the left carotid with the aorta below.

The left recurrent laryngeal nerve must be seen and retracted in the lower part of the exposure.

The following case concerns a nineteen-year-old man suffering from a complete spastic paraplegia of five months' duration. There was a complete flexion contracture of both hips and knees and complete sensory loss below D.4. Laminectomy had been performed from D.1 to D.3,

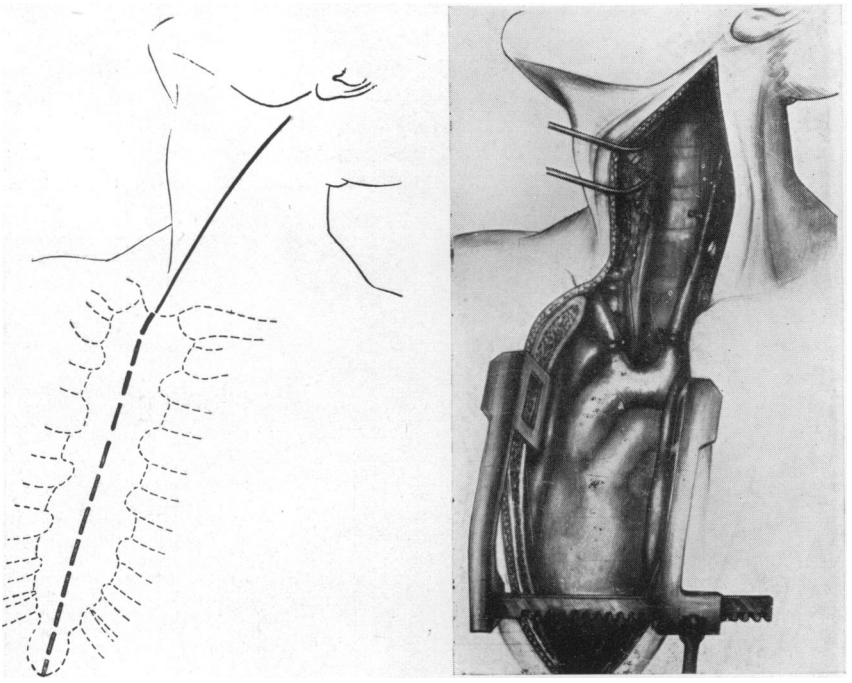


Fig. 3 (*a*) and (*b*). Technique of the cervico-sternotomy for approach of the cervico-thoracic spine. Notice the inferior limit—D.3—of the operative field, at the superior border of the crossa aortae.

then extended later to include D.4 and D.5. The general condition of the patient was very poor with paralysed sphincters and infected pressure sores. X-ray showed an osteolytic tumour destroying the first and second dorsal vertebrae and the upper part of the third dorsal (Fig. 4 (*a*) and 4(*b*)). The patient was operated on by the anterior cervico-thoracic approach, the sternum being split and the anterior aspect of the spine widely exposed from C.5 to D.3. The tumour was opened and curetted. The vertebral bodies were destroyed; their remains were removed by trephining, exposing the anterior aspect of the dura over a length of 5 cm. (Fig. 5). The tumour was necrotic and bleeding involving the prevertebral area.

It could not be curetted very far laterally and so the operation remained incomplete. The operation was completed by inserting a bank bone graft into the gap left in the anterior surfaces of the vertebrae.

The histological findings showed a chondroma, the clinical behaviour of which is strongly suspicious of malignancy, since despite three months' improvement with recovery of sensation and diminishing contractures the neurological signs are now increasing.

For the approach to the *mid-thoracic and lower thoracic vertebrae,* we follow the operative procedure recently described by Hodgson and Stock, i.e., by a left transpleural approach and resection of one rib. The aorta is freed by section of a certain number of intercostal arteries necessary for exposing the lesion ; then the aorta is easily retracted towards the right side.

We quote the case of a twenty-nine-year-old man who had suffered from extensive Pott's disease of the lower thoracic spine for three years and had been submitted to a posterior fusion. Three months ago he had a recrudescence of paraplegia.

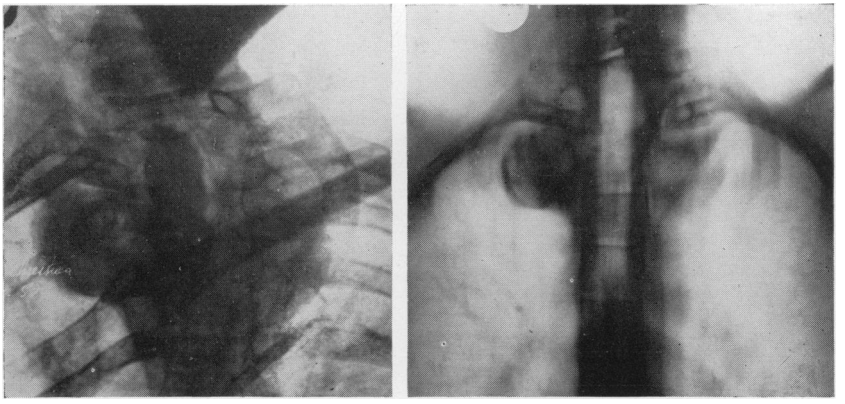


Fig. 4 (*a*) and (*b*). Frontal radiography and tomography of a nineteen-year-old patient with paraplegia due to a chondro-sarcoma involving D.1-D.2-D.3 and extending bilaterally into the posterior thoracic area. Notice the spinal block at D.3-D.4.

The neurological signs were localised at D.7. An abscess is seen from D.6 to D.9 ; another abscess can be felt in the left iliac fossa.

An anterior decompression was carried out by resection of the eighth rib ; five intercostal vessels were ligated and cut on the left side of the aorta, which was then easily retracted to the right. The abscess was isolated, opened and evacuated. The vertebral bodies were exposed over

a length of 8 cm. down to the dura. Fluid pus escaped from the spinal canal. The dura was freed.

The bony gap was filled with grafts taken from the excised rib.

The post-operative course was notable for the quick resolution of the paraplegia. It was necessary of course subsequently to stabilise the

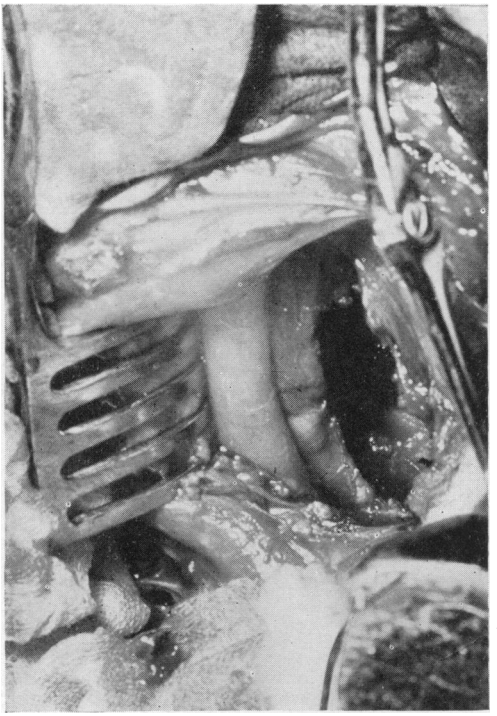


Fig. 5. Photograph of operation on the case showing the surgical trepanation of the vertebral bodies D.I-D.2-D.3. The trachea is retracted on the right; oesophagus is free from the grasp of the retractor. The left innominate vein has been divided. The innominate artery is seen, being retracted on the right.

portion of the spine which had been most recently involved and to evacuate the lumbar abscess.

CONCLUSION

In conclusion, we submit that, although this anterior approach is rarely necessary for ordinary Pott's disease, for the treatment of paraplegia it has its place alongside the well-established and competent antero-lateral decompression described by Capener in 1954, from which the results are

usually good, as has been established by the work of Griffiths, Seddon and Roaf.

One question remains : What is the possibility of vascular damage to the spinal cord from these extensive procedures ? It remains for further experimental, anatomical and clinical research to demonstrate what are the critical areas of blood supply to the cord and how extensive can be the division of the intercostal arteries. Is their division less dangerous near their origin from the aorta or close to the foramina, including the ligation of their radicular branch ?

SUMMARY

Three methods of surgical approach for the treatment of disease of the cervical and thoracic bodies are described :

(*a*) To the cervical bodies, antero-lateral route in front of the sterno-mastoid muscle.

(*b*) To the cervico-dorsal junction and the first thoracic vertebrae, the antero-lateral cervicotomy with osteotomy of the sternum in the midline and section of the left innominate vein.

(*c*) To the mid-thoracic and low-thoracic vertebrae the left transpleural approach, as described by Hodgson and Stock, is advocated. A case is reported concerning each of the described techniques.

RÉSUMÉ

Trois voies d'abord sont étudiées permettant de découvrir et de traiter les lésions des corps vertébraux cervicaux et dorsaux.

(*a*) Pour le cou, la cervicotomie antéro-latérale, pré-sterno-mastoidienne.

(*b*) Pour la jonction cervico-thoracique et les premières dorsales, la cervicotomie-sternotomie avec section du tronc veineux innominé gauche.

(*c*) Pour les dorsales moyennes et basses, la voie transpleurale gauche de Hodgson et Stock est adoptée.

Une observation est apportée à propos de chacune des techniques décrites.

REFERENCES

CAPENER, N. (1954) *J. Bone J. Surg.* **36B**, 173.

GRIFFITHS, D. Ll., SEDDON, H. J., and ROAF, R. (1956) *Pott's paraplegia.* Oxford University Press.

HODGSON, A. R., and STOCK, F. E. (1956) *Brit. J. Surg.* **44**, 266.

ANATOMICAL MUSEUM

THE SPECIAL DISPLAY for the month of October consists of specimens illustrating the variations in structure of the alimentary canal.